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Taiwan Association for Aerosol Research

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Announcement

The 16th joint board meeting had been held on December 2, 2023. Four new individual members were reviewed and became permanent member of the Taiwan Aerosol Research Association. Let’ s welcome them ！

Permanent Individual Member

Chung-Yu Guan

Assistant Professor
Department of Environmental Engineering, National Ilan University

Shi-bo Wang

Postdoctoral Research Associate
Department of Mechanical Engineering, The University of Texas at Dallas

Shivani Shirke

PhD Student
Institute of Environmental Engineering, National Sun Yat-Sen University

Yi-Tien Tsai

Masters Student
Institute of Environmental Engineering, National Sun Yat-Sen University

Oral History of TAAR

This year's aerosol symposium coincided with the return of the founding president, Professor Chiu-Sen Wang, who came back to participate. Seizing the opportunity, Honorary President Chung-Te Lee invited Professor Chiu-Sen Wang, Man-Ting Cheng, Wen-Jhy Lee, Neng-Huei Lin, and Honorary President Moo-Been Chang, as well as President Ying-I Tsai, to review the establishment of the Aerosol Society. After its founding, the society hosted the International Aerosol Conference in 1993, followed by the 6th International Aerosol Conference (IAC) in 2002 and the 5th Asian Aerosol Conference (AAC) in 2007. In sharing the planning and organizing process, Honorary President Neng-Huei Lin also discussed the fundraising and organization of the 2000 Atmospheric Sciences and Applications to Air Quality International Symposium (ASAAQ). Participants also reminisced about the founding principles and future development of the Aerosol and Air Quality Research (AAQR) journal published by the society. President Tsai explained the reasons and progress behind the establishment of the Taiwan and Thailand (T&T) collaboration. The entire process was documented by Secretary-General Sheng-Hsiang Wang, who led the society's staff, with precious audiovisual files recorded by Yu-Ren Chang.

Honorary President Chung-Te Lee pointed out at the opening that this was a rare opportunity. After the establishment of the Aerosol Society, through exchanges with internationally renowned scholars, Taiwan's aerosol research level has been elevated. These historical processes should be documented. Under his guidance, attending professors reviewed the various conference processes over the years, including application procedures, preparation processes, funding sources, and the environmental conditions at the time. With the assistance of various parties, each conference was successfully and satisfactorily organized.

Honorary President Chiu-Sen Wang first shared some details of the 2002 International Aerosol Conference (IAC). He noted that at that time, Professor Chuen-Jinn Tsai served as the chairman of the conference, while he himself was responsible for the technical agenda. President Wang emphasized that becoming a member of the International Aerosol Research Alliance was a lengthy process that required undergoing rigorous scrutiny, but it ultimately proved successful. He recalled the involvement of Honorary President Chuen-Jinn Tsai and himself in multiple conferences of the International Aerosol Society. The inclusion of the Taiwan Aerosol Research Society was achieved through diligent efforts and the assistance of international friends.

Honorary President Man-Ting Cheng supplemented information about the preparation process for the 2002 International Aerosol Conference (IAC). She mentioned that the venue had been confirmed two years in advance, and they faced the threat of a typhoon just before the opening. Fortunately, foreign scholars did not back down, especially with the lucky coincidence of the typhoon subsiding just before the conference, which contributed to the smooth progress of the symposium. Honorary President Cheng emphasized the success of that conference and the impact it had on the participating students, instilling passion and confidence in them for the Aerosol Society. Honorary President Chung-Te Lee added details about the lively atmosphere at the conference dinner's beer party, becoming an unforgettable moment in history.

In September 1993, shortly after the establishment of the society in February of the same year, Honorary President Man-Ting Cheng organized the society's first international symposium. She invited eight prominent aerosol researchers from both domestic and international backgrounds to give lectures. She expressed special gratitude for the generous sponsorship from the Ministry of Labor at that time. The participation of scholars from the United States and Japan was particularly helpful in promoting international exchanges, laying the foundation for future applications to host the International Aerosol Conference (IAC). This initiative also allowed domestic scholars to broaden their perspectives on international aerosol research. With the strong assistance of several members of the Aerosol Society, the symposium was successfully completed, and now, in the blink of an eye, it has been 30 years.

Honorary President Wen-Jhy Lee then reported on the organization of the 2007 Asian Aerosol Conference (AAC). The right to host an international symposium is not easily obtained through a simple application process, as there is often competition from other countries. At that time, Thailand had the support of Japan, but fortunately, we received support from India and South Korea. We applied for funding for the AAC from Kaohsiung City, the National Science Council, the Mainland Affairs Council, the Environmental Protection Administration, and local environmental bureaus at an early stage. The number of participants that year exceeded 500, including more than 500 domestic attendees. The financial settlement involved dealing with subsidies from foreign scholars and restrictions on banquet expenses, which added administrative procedures. Fortunately, many students and graduate students from Cheng Kung University were mobilized at that time, and they systematically and successfully completed various tasks, establishing connections with many professors from Asia.

In the retrospective process, Honorary President Moo-Been Chang pointed out that the society was initially named CAAR and later changed to TAAR. Honorary Presidents Chiu-Sen Wang, Wen-Jhy Lee, Chung-Te Lee, and President Ying-I Tsai respectively explained and reminisced about the considerations and decision-making process behind the name change.

Honorary President Chiu-Sen Wang also took this opportunity to explain the establishment of the Chiu-Sen Award. The main purpose of this award is to encourage young researchers to inherit Taiwan's aerosol research legacy. Incidentally, Secretary-General Sheng-Hsiang Wang, who attended the event, is an outstanding young scholar who has received the Chiu-Sen Award.

Regarding the T&T Symposium that promotes aerosol research exchange with Southeast Asian countries, President Ying-I Tsai pointed out that T&T was initially founded for scholars and students from Taiwan and Thailand to exchange ideas. Later, it expanded into "Theory and Technique" for broader exchanges with Southeast Asian countries. President Cai emphasized that this exchange carries the implication of representing Taiwan, enabling the expansion of Taiwan's environmental protection industry into Southeast Asia. This, in turn, facilitates the integration of Southeast Asian students who come to Taiwan to study into the industry. Additionally, it helps foster collaboration with various Southeast Asian countries.

Honorary President Neng-Huei Lin joined the discussion at this point and shared insights into organizing the ASAAQ in 2000. The symposium attracted over 500 participants from 45 countries. At that time, Professor Chuen-Jinn Tsai was already aware of the upcoming IAC, so he closely observed the proceedings of the symposium. Originally, Mexico was supposed to host the event, but due to budget constraints, Taiwan took over at short notice. The preparation time was limited, but fortunately, funding applications received strong support from various units.

A few days before the conference, the Executive Yuan officially announced the suspension of the construction of the Fourth Nuclear Power Plant (Nuclear Plant 4). This decision brought significant changes to the conference's arrangements. During the "Master Dialogue" session at the conference, invited scholars had differing opinions on the suspension of Nuclear Plant 4. The conference's scheduled tours were also disrupted by a typhoon. These challenges left deep impressions on Professor Lin. The success of various activities was made possible through the collaboration of co-organizing units and the assistance of Chung Yuan Christian University's atmospheric science students.

During the discussion, the establishment and current challenges of the society's important publication, the AAQR journal, were addressed. Honorary President Chiu-Sen Wang first mentioned that after the society's establishment, he recognized that the United States, Europe, and Japan all had specialized journals. Therefore, the society began with the publication of newsletters under the guidance of Professor Chih-Shan Li. Later, Professor Wen-Jhy Lee took on the more challenging task of academic journal publishing, and from the beginning, Professor Chiu-Sen Wang insisted that it be an English-language journal. The review process and English editing for AAQR, after its establishment, became a labor-intensive task for Professor Chiu-Sen Wang.

Through the efforts of Professors Wen-Jhy Lee, Chuen-Jinn Tsai, and Neng-Huei Lin, AAQR successfully applied to become an SCI international journal. During the peak of the COVID-19 pandemic, AAQR published a special issue on COVID, which received a significant response, reaching an Impact Factor as high as 4.5. However, after the pandemic eased, the number of other journals increased significantly. Each journal collaborated with international major publishers, and these publishers, with their influential marketing efforts, systematically provided scholars with relevant literature, reducing the inconvenience of searching. As a result, it became easier to enhance the citation rates of these journals.

Currently, AAQR's self-calculated Impact Factor is only 1.5, and the number of submitted papers continues to decline. The future direction is being considered, whether to collaborate with publishers, be acquired by publishers, or find a better approach. Professor Neng-Huei Lin and the editorial board are still in the process of considering and making efforts.

The entire discussion reviewed crucial historical moments in the establishment of the Aerosol Society, highlighting the collective efforts of past and present presidents, board members, members, and students in overcoming various challenges. This collaborative effort led to the successful organization of international conferences, showcasing the journey and achievements of the society. This historical period will remain a valuable memory for the sustainable development of the Aerosol Society, laying a solid foundation for future aerosol research and academic international exchanges.

Former and current presidents

New Book on Aerosol

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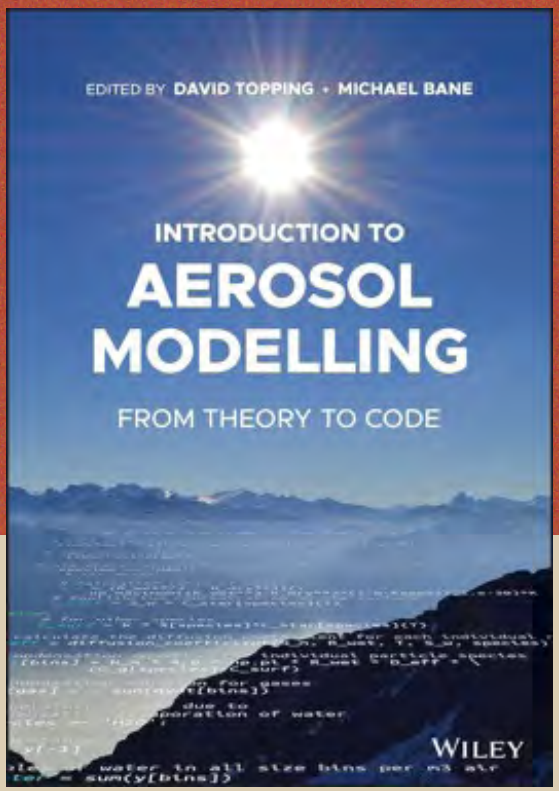
by David L. Topping (Editor), Michael Bane (Editor)



An aerosol particle is defined as a solid or liquid particle suspended in a carrier gas. Whilst we often treat scientific challenges in a siloed way, aerosol particles are of interest across many disciplines. For example, atmospheric aerosol particles are key determinants of air quality and climate change. Knowledge of aerosol physics and generation mechanisms is key to efficient fuel delivery and drug delivery to the lungs. Likewise, various manufacturing processes require optimal generation, delivery and removal of aerosol particles in a range of conditions.

There is a natural tendency for the aerosol scientist to therefore work at the interface of the traditional academic subjects of physics, chemistry, biology, mathematics and computing. The impacts that aerosol particles have are linked to their evolving chemical and physical characteristics. Likewise, the chemical and physical characteristic of aerosol particles reflect their sources and subsequent processes they have been subject to. Computational models are not only essential for constructing evidence-based understanding of important aerosol processes, but also to predict change and impact. Whilst existing textbooks provide an overview of theoretical frameworks on which aerosol models are based, there is a significant gap in reference material that provide training in translating theory into code.

The purpose of this book is to provide readers with exactly that. In following the content provided in this book, you will be able to reproduce models of key processes that can either be used in isolation or brought together to construct a demonstrator 0D box-model of a coupled gaseous-particulate system. You may be reading this book as an undergraduate, postgraduate, seasoned researcher in the private/public sector or as someone who wishes to better understand the pathways to aerosol model development. Wherever you position yourself, it is hoped that the tools you will learn through this book will provide you with the basis to develop your own platforms and to ensure the next generation of aerosol modellers are equipped with foundational skills to address future challenges in aerosol science.

Introduction of Aerosol Researcher

Tsun-Jen Cheng

Profile

Professor Tsun-Jen Cheng recently retired from the Institute of Environmental and Occupational Health Sciences at the College of Public Health, National Taiwan University. He has transitioned to a position as a research fellow and adjunct professor. Professor Cheng graduated from Taipei Medical University with a degree in Medicine. He later obtained a Master in Public Health and a Doctorate in Cancer Biology from the Harvard T.H. Chan School of Public Health. He completed residency training in Internal Medicine and Preventive Medicine in the United States, earning board certification in both specialties.

Throughout his career, Professor Cheng has served extensively at the Institute of Occupational Medicine and Industrial Hygiene and the Department of Public Health at the College of Public Health, National Taiwan University. He is also a joint-appointed professor in the Environmental and Occupational Medicine Division at the College of Medicine, National Taiwan University. Professor Cheng has held various leadership positions, including Director of the Safety and Health Office at National Taiwan University Hospital, Chief of the Occupational Health Division at the Environmental Protection and Occupational Safety and Health Center, National Taiwan University, and Director of the Institute of Occupational Medicine and Industrial Hygiene at the College of Public Health, National Taiwan University.

His expertise lies in environmental and occupational medicine, respiratory toxicology, and molecular epidemiology. His research encompasses topics such as cohort study of vinyl chloride workers, particulate air pollution, health risks associated with nanotechnology, and the exposure and toxicity of microplastics. Professor Cheng has also contributed to the scientific community by serving as a reviewing editorial board member and associate editor for Environmental Health Perspectives, an editorial board member for Inhalation Toxicology, and an editor for Aerosol and Air Quality Research.

Professor Cheng has previously led projects funded by the Ministry of Science and Technology, focusing on the toxicology of atmospheric particulate matter. These projects aimed to explore the systemic toxicity of fine and nano-sized particles, with significant contributions to the research on cardiovascular diseases and neurodegenerative diseases. Professor Cheng has also served as the principal investigator for projects "Review and Assessment of Air Quality Standards, Research and Development of Fine Particulate Matter Air Quality Standards" funded by the Environmental Protection Administration. The recommended standards for atmospheric fine particulate matter were subsequently adopted as national air quality standards.

Additionally, Professor Cheng has been the principal investigator for several years on the National Science Council's Nanotechnology Health Risk Assessment and Management Integration Project. His extensive research in the toxicity of micro and nanoparticles has played a vital role in guiding the country's development of nanotechnology, emphasizing the importance of environment, health and safety (EHS). He has also been a member of the White Paper Committee on Health Risks of Nanotechnology.

Origins and Background of Particle Toxicology Research

My connection with aerosols and particulate matter toxicity was incidental. Around the year 2000, as the polyvinyl chloride workers' cohort study was coming to a close, I was seeking new research topics. At that time, air pollution, especially the toxicity and health effects of fine particulate matter, had become a significant public health concern. I initially joined Professor Chiu-Sen Wang' s air pollution program project. Later, with the support of the Environmental Protection Agency, Professor Chang-Chuan Chan established a supersite station and conducted research on particle exposure and toxicity. At that time, the team included Professor Chung-Te Lee, who conducted measurements of fine particulate matter, and Professor Song-Lih Huang, who studied respiratory diseases. I focused on cardiovascular toxicology.

Epidemiology studies had already made numerous discoveries regarding fine particulate matter, especially the results of the Harvard Six Cities Study adopted by the U.S. Environmental Protection Agency, which established the world's first fine particulate matter standard. However, there were still controversies, particularly regarding the causal relationship with cardiovascular diseases. Thus, my initial research involved using animal experiments to investigate whether fine particulate matter caused cardiovascular toxicity.

Atmospheric Particulate Neurotoxicity

In addition to causing cardiovascular diseases, epidemiological research has found associations between atmospheric particulate matter and cognitive and degenerative diseases. We also collaborated with Dr. Da-Fu Chen, using disease animal models to investigate the neurotoxic effects. Using the same atmospheric particulate exposure platform, we found that acute exposure to particulate matter increases oxidative stress and inflammation in the nervous system, affecting memory. Chronic exposure, on the other hand At that time, with the support of the Environmental Protection Administration, we received funding and imported a particulate concentrator from the University of Southern California for experiments on particulate inhalation toxicology. Professor Eric Wang was responsible for the instrumentation and operation. We started with acute toxicity studies, and fortunately, the project obtained advanced monitoring equipment for the circulatory system. This allowed us to implant blood pressure and electrocardiogram monitors into rats, obtaining wireless data for analysis.

Upon inhaling concentrated atmospheric particulate matter, we observed changes in heart rate, blood pressure, and autonomic nervous system activity in rats, supporting epidemiological research findings. In this early stage, due to the limited number of instruments, we collaborated with Professor Jing-Shiang Hwang. Using a repeated exposure approach and statistical modeling, we confirmed that atmospheric particulate matter caused blood pressure and electrocardiogram changes in three rats, as published in the Environmental Health Perspectives journal.

Using this model, we successfully investigated the cardiovascular toxicity of particulate matter from Asian dust storms. These findings were later validated in subsequent epidemiological studies. Subsequently, we conducted chronic exposure studies. Since long-term exposure operations with the particulate concentrator were challenging, we developed a simple continuous exposure chamber for atmospheric particulates that was easy to operate and maintain. The particle size distribution in the suspended particulate matter in this exposure chamber was later verified by Professor Charles C.-K. Chou. Our developed continuous exposure method was also adopted by many research institutions to explore the toxicity of real-world low-concentration suspended particulate exposure.

On the ninth floor of the public health building on Xuzhou Road, after exposing animals with high blood sugar to ambient particles for three months, we compared them with the control group. We found increased blood sugar, oxidative stress, inflammation, thickening of large blood vessel walls, and sclerosis of small blood vessels in the kidneys. These studies provided local data and confirmed that chronic exposure to fine particulate matter leads to cardiovascular diseases. Moreover, diabetic individuals are at high risk for air pollution and need special attention.

In addition to animal experiments investigating particulate toxicity, we collaborated with Professor Kai-Jen Chuang, using secondary databases to link particulate concentrations with health markers. We found that prolonged exposure to particulate matter in the elderly leads to hypertension, hyperlipidemia, and hyperglycemia. This research significantly contributes to our understanding of the mechanisms of particulate cardiovascular toxicity and has been consistently listed for eight consecutive years as a high-impact publication in the field.
, leads to a decrease in overall brain volume, a reduction in nerve cells, the deposition of beta-amyloid proteins, and an impact on the neural fibers of the white matter. These research findings align with epidemiological studies, confirming that atmospheric particulate matter can lead to cognitive and degenerative diseases.

To further understand the toxicity of traffic-related pollution, in our interdisciplinary project, Professor Ta-Chih Hsiao established a particulate monitoring and respiratory exposure platform for traffic pollution sources in Zhonghe Sports Park. Professor Hsiao-Chi Chuang found that traffic-related particulate pollution affects central nervous system pathology and memory, particularly involving inflammation and changes in autophage markers in the hippocampus. Additionally, Professor Kai-Jen Chuang discovered that the blood pressure and inflammatory responses of nearby residents are associated with exposure to ultrafine particulate matter.

Nanoparticle Toxicology

Around the year 2000, the rise of nanotechnology sparked our interest in the potential toxicity of nanoparticles. In the early stages, I joined Professor Fu-Tien Jeng's atmospheric nanoparticle project team, conducting cell experiments and tracheal instillation animal experiments to explore the toxicity of nanoparticles. At that time, Professors Chih-Shan Li and Chih-Chieh Chen were also members of the subproject.

Later, I formed a inhalation toxicology research team and continued to receive funding from the National Science and Technology Council to investigate the characteristics and toxicity of engineered nanoparticles. Dr. Hung-Min Chien from the Industrial Technology Research Institute assisted in establishing a chamber for the generation of zinc oxide nanoparticles and animal exposure. We conducted acute and chronic animal experiments and found that, in addition to respiratory diseases, nanoparticles also affect cardiovascular and central nervous system toxicity. Additionally, we discovered that, apart from surface area, solubility is also a factor influencing nanoparticle toxicity, contributing to a better understanding of the mechanisms behind nanoparticle toxicity.

Collaborating with Professor Pei-Shan Liu from Soochow University, we found that zinc oxide nanoparticles enter cells through phagocytosis, subsequently dissolving and releasing zinc ions. This provided a reasonable explanation for the novel toxicity mechanism of zinc oxide nanoparticles. Later, Professor Ta-Chih Hsiao joined the team to assist in improving the nanoparticle generator, producing silver nanoparticles at higher temperatures. Collaborating with Professor Yaw-Huei Hwang, we investigated the distribution of silver nanoparticles in the body, discovering that nanoparticles can be absorbed, but the majority deposits in the respiratory tract, corroborating our earlier findings.

Conclusion

I am delighted to have had the opportunity to establish a Inhalation Toxicology Laboratory in the field of aerosols, investigating the toxicology of atmospheric particulate matter and engineered nanoparticles. Our research findings in the toxicology of atmospheric particulate matter support epidemiological research, aiding in establishing causal relationships between atmospheric particulate matter and diseases. This has been instrumental in contributing to the development of air pollution regulations both domestically and internationally. In the realm of nanoparticle research, prior to human health studies, we have used toxicological research methods to provide knowledge for government and international organizations in assessing nanomaterial risks, assisting in risk management. The Citizen of Earth's 2023 Spring Couplets convey the message of "freedom to breathe." We hope that the outcomes of our research endeavors can enhance air quality in Taiwan, enabling everyone to breathe freely and enjoy fresh, clean air.

Acknowledgments

Establishing the Inhalation Toxicology Laboratory and completing research on the toxicology of atmospheric and nanoparticle matter would not have been possible without the contributions of many professors, postdocs, assistants, and students. Their involvement has been crucial to the success of these research endeavors.

A special thanks go to Professor Lung-Chi Chen from New York University for providing valuable consultations in inhalation toxicology. Particularly, in the early stages of our research, the opportunity to visit their research institution, participate in discussions on the PM Center's projects, and be introduced to the U.S. Environmental Protection Agency laboratory greatly contributed to absorbing the latest knowledge and techniques. This experience has been immensely beneficial in advancing inhalation toxicology research in Taiwan.

Calendar of Events

Date
March 21-22, 2024

Conferences
2024 Theory and Technique Taiwan Forum on Sustainable Environment

Location
National Yang Ming Chiao Tung University
Taipei, Taiwan
(Yangming Campus)

Date
August 25-30, 2024

Conferences
The European Aerosol Conference 2024

Location
Tampere, Finland

Date
September 20-21, 2024

Conferences
The 31st International Conference on Aerosol Science and Technology

Location
National Ilan University
Yilan, Taiwan
(Yangming Campus)

Calendar of Events

Date
October 21-25, 2024

Conferences
AAAR 42nd Annual Conferences

Location
Albuquerque, NM

Date
November 3-7 , 2024

Conferences
13th Asian Aerosol Conference

Location
Sarawak, Malaysia

Website
https://www.asianaerosol2024.com/